

FIFTH ANNUAL REPORT

OF THE

Nevada Agricultural Experiment Station.

FOR 1892.



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Library
Nevada Agricultural Experiment Station.

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Fred H. Hillman, M. S.	Entomologist and Botanist
Ransom H. McDowell, B. Sc.	Agriculturist and Horticulturist
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Hannah K. Clapp, A. M.	Librarian
R. A. Lounsbury	Foreman of Farm



NEVADA AGRICULTURAL EXPERIMENT STATION BUILDING.



REPORT.

RENO, Nevada, January 27, 1893.

To His Excellency, R. K. Colcord, Governor of Nevada:

SIR: In accordance with the provisions of the Congressional Act establishing the Stations, and with the statutes of Nevada, I have the honor to transmit to you the fifth annual report of the Nevada Agricultural Experiment Station, said report containing the financial report for the fiscal year ended June 30, 1892, and the general operations of the Station for the year ended December 31, 1892.

Very respectfully,

GEO. H. TAYLOR,
Secretary of the Board of Control.

DIRECTOR'S REPORT.

OFFICE OF DIRECTOR
AGRICULTURAL EXPERIMENT STATION,
RENO, Nevada, January 26, 1893. }

To the Board of Control of the Nevada Agricultural Experiment Station :

GENTLEMEN: I have the honor to submit herewith my report as Director of the Experiment Station for the year ended December 31, 1892:

The station staff remains the same as one year ago, with one exception. Last August, Mr. H. P. Brown, foreman of the farm, severed his connection with the Station, and Mr. R. A. Lounsbury of the Colorado Agricultural College was employed as foreman in his place. Mr. Lounsbury has long been engaged in experimental work and is a very efficient man for the position.

Meetings of the staff have been regularly held on the second Saturday of each month throughout the year. At these meetings reports have been made on the experiments in operation, future experiments outlined, the publication of bulletins and articles from newspapers considered, and the general work and efficiency of the Station discussed.

The three departments of Agriculture and Horticulture, Chemistry and Entomology and Botany made very creditable exhibits at the State Fair in Reno, the Agricultural District Fair in Carson City, and the Chemist made an exhibit of dairy apparatus at the Sierraville, California, Fair. All of these departments attracted a good deal of attention. It is the intention another season to exhibit at a still greater number of fairs, and thus endeavor to bring the work of the Station into even closer relations with the people of the State.

Preparations are being made for a small but representative exhibit at the World's Fair. Fifteen samples of soil taken in different counties of the State are now in readiness; also varieties of grain and grasses. Something is also being done by the Entomologist and Botanist in that direction. Photographs of the Station building, laboratories, library, farm, etc., have been prepared for that purpose.

Meteorological observations have been regularly taken at the

Station at 7 A. M., 2 P. M. and 9 P. M., a record kept, and at the end of each month a report sent to the State Observer at Carson City.

Three bulletins have been issued during the year, as follows: No. 16, "Creamery Industry;" No. 17, "Woolly Aphis," and No. 18, "Cheese and its Manufacture." The fourth, No. 19, on "Sugar Beets," is shortly to be issued.

Quite a number of books, periodicals and pamphlets have been added to the library, which, though small, has been carefully selected, and is well adapted to its purpose.

Owing to the small number and crowded condition of the farm buildings, some of the wagons, carts, tools, implements, etc., are not properly housed. I would, therefore, recommend the erection of a substantial but inexpensive building for their protection.

It seems to me that the time is fast approaching, if not already here, when a series of farmers' institutes, held during the months of December, January and February, would be of great service in advancing the interests of agriculture, and in bringing the farming community of this State into closer touch with the Station and to a better appreciation of its work. I desire to call the attention of the Board of Control to this matter, and to suggest that arrangements be made for carrying out this plan.

A number of newspaper bulletins on subjects of vital interest have, from time to time, appeared in all the newspapers of the State, and in this connection we desire to express our obligations to the press for the kindness and courtesy in publishing these, as well as other matters.

The following reports of the different members of the staff give specific information in regard to their departments.

Respectfully submitted,

STEPHEN A. JONES,
Director.

FINANCIAL REPORT.

Nevada Agricultural Experiment Station.

<i>Receipts:</i>	
Appropriation by the United States Government for the fiscal year ended June 30, 1892-----	\$14,999 44
<i>Expenditures:</i>	
Salaries -----	\$8,770 60
Labor-----	1,661 34
Office furniture and fixtures-----	121 00
Incidentals -----	61 65
Freight, drayage and express-----	254 83
Chemical apparatus and supplies-----	564 11
Printing -----	962 39
Library -----	46 66
Botanical apparatus and supplies-----	11 35
Addition to building-----	490 83
Field experiments -----	153 34
Postage and stationery-----	57 17
Traveling expenses-----	844 30
General supplies-----	114 70
General fitting -----	31 76
Farm -----	194 83
Fencing and drainage -----	19 43
Water, fuel and gas-----	337 00
Laboratory furniture -----	201 05
Sugar beet experiment-----	55 60
Veterinary science-----	15 50
Total -----	\$14,999 44

I hereby certify that the foregoing financial report of the Nevada Agricultural Experiment Station is correct.

GEORGE H. TAYLOR,
Secretary of the Board of Control.

RENO, Nev., January 28, 1893.

We, the undersigned duly appointed auditors of the Nevada Agricultural Experiment Station, hereby certify that we have examined the accounts of said Station for the year ended June 30, 1892, and find them correct in every particular. All the vouchers, Nos. 784 to 1,040 inclusive, are on file and account for every item

expended during the fiscal year reported. The foregoing report of the Secretary embodies the results as shown on the books.



H. L. FISH, Auditor.
ROBERT LEWERS, Auditor.

I hereby certify that the above are the signatnres of H. L. Fish and Robert Lewers, the duly appointed auditors of Station accounts, and further, that the above is the seal of the University of Nevada.
STEPHEN A. JONES, Director.

TREASURER'S REPORT

Of the Nevada Agricultural Experiment Station.

Receipts :

From the Treasurer of the United States, as per appropriation for the fiscal year ending June 30, 1892, under Act of Congress, approved March 2, 1887 -----	\$14,999 44
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Disbursements :

Amount paid out upon warrants Nos. 765 to 1,021, inclusive, drawn by the Board of Control of the Nevada Agricultural Experiment Station-----	\$14,999 44
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I hereby certify that the above is a full and correct report for the fiscal year ending June 30, 1892.

T. R. HOFER, Treasurer.

I, the undersigned, hereby certify that the above is the signature of T. R. Hofer, Treasurer of the Nevada Agricultural Experiment Station.

S. A. JONES, Director.

DEPARTMENT OF AGRICULTURE AND HORTICULTURE.

To the Director :

SIR : I have the honor to submit the following report as indicating the main features of the work for 1892. The area used was largely the same as that selected for field experiments last season, with a slight increase due to the use of the hillside east of the orchard for raspberries and currants, and by planting a portion of the garden crop between the rows of young apple trees. The quarter-acre list of plats was increased with I and J using ground occupied with Fall grain in 1891. The iron stakes put at the corners, established by the Mining Department to maintain plat boundary lines in the same position from year to year, are proving to be the right stakes in the right place. The plats used for field experiments were fairly manured except No. 7, planted to potatoes, plowed the latter part of February, and well fitted for seeding by the thorough use of harrow and roller.

Different Amounts of Seed Wheat.

Table No. 1 gives the results of a continuation of the tests of thick and thin seeding, using quarter acres B, C, D and E, which were planted to sugar beets in 1891. The grain on these plats, and this was true of all the early sowing this year, suffered from freezing and the strong west winds; so much so that at times it was a question whether it would be best to allow the crop to go through the season or to plow it under.

TABLE NO. I.

Wheat—Different amounts of seed sown.

Variety, White Australian; date sown, March 22d; full head, July 2d; date ripe, August 5th.

Rate of Seeding per Acre. Pounds.	Yield, Quarter Acre Plat.		Yield, Less Seed Sown.		Length of Straw, Inches.	Length of Head, Inches.	Seed, Quarter Acre.	
	lbs.	oz.	lbs.	oz.			lbs.	oz.
45	288	8	277	4	32 to 40	3 to 3.5	11	4
75	320	3	301	7	34 to 38	3 to 3.75	18	12
90	282	11	260	3	37 to 38	3 to 3.75	22	8
105	282	15	256	11	36 to 38	3 to 3.5	26	4

The variety used in this and the vitriol test was the same as last year, the White Australian. It would be advisable in a test of this kind to add to the scale, making the test the rate of 30, 45, 60, 75, 90, 105 and 120 pounds per acre. This is impracticable if the area given to each rate of seeding is held at one-fourth of an acre, with the amount of land at our disposal at present, and considering the need of space for other crops that are worthy of attention.

I am inclined to think that our plat work would be more in touch with the practical farmers if important experiments were conducted on plats of five or ten acres each.

The probability is that, as a general rule, farmers sow more seed per acre than is necessary. Thorough cleaning to remove all weed seed, straw, and refuse material that might clog a seeder, also small or broken kernels, would put every ounce of seed sown, in a well prepared seed bed, in a condition to grow. An excellent way to secure good seed is to select a sufficient amount of the best standing grain in the field for the seed supply of the next year. Reap, stack, thresh and store this by itself.

Vitriol.

One-eighth of an acre of White Australian, the same variety used for this trial last year, was sown with the results shown in Table No. 4. One pound of vitriol was used to one-half barrel of water, soaking the wheat for twenty minutes. Every farmer who raises grain to any extent for market recognizes the fact that the profits are higher when it grows and threshes in perfect condition. If this condition cannot be secured, then as near this as possible. One of the obstacles experienced, and at times seriously, is the appearance of smut. In 1891 no smut was noticed in any of the wheat plants. This season two heads of smut were noticed in the one-eighth sown without vitriol. Thinking it might be of benefit to Nevada farmers, some extracts are given from a recent bulletin by Professor P. M. Harwood, of Michigan, on smut and the Jensen treatment.

TABLE NO. 2.

Date sown, March 23d; area, $\frac{1}{8}$ acre of each; amount of seed, 11 pounds 4 ounces.

Date ripe, August 8th: yield of wheat treated with vitriol, 150 pounds 3 ounces; length of straw, 38 to 41 inches; length of head, 3 inches to 4.5 inches; yield of wheat without vitriol, 162 pounds 9 ounces; length of straw, 33 to 38.5 inches; length of head, 4.5 inches.

Table No. 3 gives notes on twenty-one varieties of wheat grown this season. The Beryl, Judkin, Canadian Club, Chili, Sardin's, Nox and Egyptian were received from the Colorado Agricultural College this spring. The other varieties named have been grown

here two years. The Ontario has a large kernel, rather large head, is heavily bearded, somewhat difficult to thresh, and carries the longest straw of any variety we have. The Egyptian is bearded, has a short, small head, and will need additional trial to prove that it has valuable characteristics aside from early ripening, which is only one day in advance of the Red Oregon Club. The Ruby and Gypsum are considered among our best. Two small plats of each were grown without irrigation. The irrigation for the list in table 3 was April 26, May 14 and 27, June 20, July 1, 12, 20 and 29. For the quarter-acre plats, tables 1 and 2, it was April 21, May 16 and 28, June 20, July 1, 12, 20 and 28.

TABLE NO. 3.

NAME.	Date Sown.	Date Ripe.	Yield per Plat.		Area Acres.	Straw. Height. in.	Heads.	
			lbs.	oz.			Length. in.	Width. in.
Niagara.....	3-31	8-6	46	6	1-20	37 to 38	4.5 to	3-8
Ontario.....	3-31	8-10	25	1	1-40	45 to 53	3 to 4	9-16
Australian Club.....	3-31	8-2	65		1-20	37 to 41	2.5 to 3	3-8
Amethyst.....	3-31	8-5	54	15	1-20	37 to 41	3.5	1-2
Improved Fife.....	3-31	8-4	48	5	1-20	32 to 35	3 to 4	7-16
Egyptian.....	4-1	8-1	8	15	1-72	37 to 40	2.3 to 2.5	1-2
Ruby.....	4-1	8-13	59	3	1-20	38 to 42	4 to 5	5-8
Northcote's Amber.....	4-1	8-7	56	1	1-20	32 to 36	3.5 to 4	
Whittington.....	4-1	8-7	65	7	1-20	34 to 39	3	3-16
Granite.....	4-1	8-10	80	13	1-20	38 to 44	3.3 to 5	1-2
Dallas.....	4-1	8-11	74	1	1-20	39 to 43	3.5 to 4.5	1-2
Red Oregon Club.....	4-1	8-12	86	8	1-20	36 to 39	3	5-8*
								3-8†
Gypsum.....	4-7	8-13	72	15	1-20	36 to 40	3.75	1-2
Sardin's.....	4-8	8-13	49	11	3-80	41 to 45	3.75	3-8
Chili.....	4-8	8-9	19	7	1-80	34 to 36	3 to 3.5	3-8
Canadian Club.....	4-8	8-6	24	7	1-80	31 to 32	2 to 2.5	3-16
Nox.....	4-8	8-13	18	14	1-80	38 to 40	3 to 3.5	
Judkin.....	4-8	8-11	14	2	1-80	39 to 39	3.5 to 4	1-2
Beryl.....	4-8	8-12	22	7	1-80	38 to 40	2.75	7-16
Winnipeg Russian.....	4-8	8-7	25	9	1-80	38 to 39	3 to 4	1-2
Polish.....	3-30	8-9	482	1	1-2	39 to 42	5 to 7.5	

*Top width. †Bottom.

Polish Wheat.

One-half an acre of this variety was sown March 30th, using 45 pounds of seed. The stand was not as thick as desirable. This has received some attention at the United States Experiment Station at Garden City, Kansas, and was recommended by Professor Crandall, of Colorado, for further trial at the United States Grass Station in that State, which is conducted without irrigation. The reports of the flouring qualities, so far as I have talked with individuals who have given it a trial, are not flattering. The yield was reduced to quite an extent by insects severing head and stalk.

JENSEN HOT WATER TREATMENT FOR SMUT IN OATS AND WHEAT.

[Extracts from Bulletin No. 87, Michigan Agricultural Experiment Station.]

“The Stinking Smut” of wheat.

This smut, unlike that of oats, affects only the grain. In consequence the heads have nearly their normal appearance. Upon close examination the grains are seen to be swollen of a greenish color at first, but finally brown or gray. If one of these swollen smutted grains be crushed, it will be found to be filled with a dull brownish powder, which has a very penetrating and disagreeable odor. The presence of this odor, which has given rise to the common name, is a very good test for the presence of the smut. The smut is due to two very nearly identical fungi, *Tilletia foetens* (B and C), Shroet, and *Tilletia tritici* (Bj), Wint. The same treatment will destroy both.

The former of these smuts, *Tilletia foetens*, is what is known by the farmers of the southwestern part of Michigan as “high smut,” while the second, *Tilletia tritici*, is known as “low smut.” To Mr. Enos Holmes, of Buchanan, Michigan, is due the credit of first calling our attention to the fact that there is a high and a low smut. So far as I know botanists have failed to distinguish the difference between the heights of growth of these two smuts. The wheat affected by low smut grows from 1 to 1.5 feet in height, while the high smut is but little lower, if any, than the unaffected wheat.

Low Smut.

Mr. Enos Holmes, who has sent us a large number of specimens of both “high” and “low” smut, selected from different portions of the field, writes as follows about “low” smut: “The low smut does not seem to do as much damage as the ‘high’ smut. Usually, but a small amount of wheat is affected by it, while I have known and have myself had whole fields that were one-half to three-fourths smutted with high smut. Threshers tell me that ‘low’ smut is not as heavy as ‘high’ smut, and is nearly all blown out in threshing. It is the generally received opinion that there are two distinct species. I find much smut that is almost as high as the ‘high’ smut. ‘Low’ smut is usually found in such portions of the field as have been trampled by stock near some gate, for instance, or at the corners of the land in plowing where horses tramp in turning. Some of these specimens were obtained near a neighbor’s yard where his chickens worked some, and to that cause he ascribes the fact of its being smutted, though I think it is wrong, for the smut extends three or four rods along his fence and beyond the work of the chickens. The smut will average but 12 inches in height, and does very little harm except so far as the smutted heads replace sound ones, for the reason that in cutting, the smut heads are left uncut and are so near the butt of the bundle that they rattle out. I also notice that, while many plants affected by the smut

have no sound heads, very many stools will produce both sound wheat and smutted heads like those I send you."

The "high" smut, on the contrary, rarely produces sound heads on a smutted stool in this region. I have never found any myself, though I do not doubt their existence, having seen smut kernels and sound ones on the same head, also kernels which were part sound and part smut. Another point of difference is that "high" smut grows indiscriminately through the field, while the low smut is usually confined to such places as have been mentioned. Corn smut, the loose smut of wheat, that which destroys the whole head, are caused by different species of smuts, and as yet we have no remedy for them.

Method of Infection of Wheat and Oats.

The spores (seed of the smut) attach themselves to the kernels of the wheat or oats and are sown with them. When the kernel of wheat or oats germinates the smut spores also germinate and enter the young plant, growing and subsisting on the inside of the plant, until finally when the head appears it is smut instead of wheat or oats. It has cost nearly or quite as much to grow the affected plant as a healthy one. We ask for bread and receive smut. Certain conditions of soil or weather may be more favorable to the growth of smut than others; but let it be distinctly understood that its presence is not due to any condition of soil or weather. We sow smut and we reap smut. In the case of oats, the wind may carry the loose, powdery smut over the field and the spores become attached to the kernel of the oats. These spores are so small that they cannot be seen with the naked eye unless there are many together, but they are there ready to grow when the oats are sown. But probably the threshing machine is the most effective way of bringing the spores of smut into contact with the wheat and oat seed. A single kernel may have thousands of spores attached to it and yet not be observed. The threshing machine becomes a ready means of carrying the smut from one field to another. It has been found that these adhering spores may be killed by dipping the seed into hot water for a few minutes, and yet not injure the vitality of the seed. This method, known as the Jensen, or hot water method, was discovered by J. L. Jensen, of Denmark, in 1887.

Method of Treatment for Wheat and Oats.

The farmer may use his ingenuity in regard to the treating of his wheat, and use whatever conveniences he has at hand—any way so he accomplishes the desired result.

One way we find convenient is to have a kettle in which to heat the water quite hot, say 165°. Near this kettle place a barrel in which to treat the seed. Fill this barrel about one-half full of hot water from the kettle, and then, by adding either hot or cold

water, the temperature of the water in the barrel may be kept at the desired height. It will be found very convenient to have the barrel in which the seed is to be treated sunk into the ground, so that the top is only a foot or so above the surface. Into this barrel dip the seed. The dipping may be easily done by placing about a bushel of seed in a coarse gunny sack, and fasten this sack to one end of a long pole used as a lever across a notched post. The seed should be kept moving all the time while in the hot water, and by using the pole this is easily done. Oats may be treated just before sowing. After taking them out of a barrel of hot water, it is best to throw cold water over them to cool them off, and let them stand and drain two or three hours, after which they may be sown broadcast. Wheat dries much more rapidly, so that if spread out immediately after treating and left to dry a few hours, it can be sown broadcast or in a force feed drill. As the grains will be considerably swollen after their treatment, it is well to regulate the drill to feed from one to two pecks more per acre than with dry seed. It will be readily seen that this method is in the reach of every farmer. All that is required is one kettle, one or two barrels and a coarse sack. Two men in one day can treat enough oats to sow twenty acres or enough wheat to sow forty acres. One caution to be observed is that of using no bags or dishes for treated seed that have been used for the untreated seed, unless they have been first scalded. The water should be 135° when the wheat or oats are put in. Allow the grain to remain in the water five minutes, and keep the temperature above 130° . Keep the seed moving all the time it is in the barrel by means of the pole, to insure thorough treatment of all the seed. Aim to keep the temperature as nearly 134° as possible. When the seed is first put in, the temperature of the water will fall rapidly, but by adding hot water it can be raised quickly to 134° .

Germination of Wheat Treated With Hot Water.

Temperature of Water.	Time of Immersion.	Per Cent. Germinated in 24 Hours.	Total Per Cent. Germinated.
Untreated		9.8	94
130 degrees	5 minutes	14.5	90
135 degrees	5 minutes	12.4	91
140 degrees	5 minutes	6.7	73
145 degrees	5 minutes	1.0	62
150 degrees	5 minutes	0.0	33
<i>Germination of Oats</i>			
Untreated		7.3	95
130 degrees	5 minutes	23.4	93
135 degrees	5 minutes	17.3	93
140 degrees	5 minutes	6.3	94
145 degrees	5 minutes	6.5	89
150 degrees	5 minutes	5.9	89

Germination of Wheat Treated With Hot Water.

Temperature of Water.	Time of Immersion.	Per Cent. Germinated in		Total.
		47 Hours.	75 Hours.	
Untreated		100	100	100
125 degrees	5 minutes	100	100	100
128 degrees	5 minutes	100	100	100
131 degrees	5 minutes	100	100	100
132 degrees	5 minutes	100	100	100
133 degrees	5 minutes	100	100	100
134 degrees	5 minutes	100	100	100
135 degrees	5 minutes	100	100	100
136 degrees	5 minutes	90	100	100
137 degrees	5 minutes	100	100	100
138 degrees	5 minutes	85	85	90
139 degrees	5 minutes	90	90	100
140 degrees	5 minutes	75	90	95
141 degrees	5 minutes	35	55	65
142 degrees	5 minutes	40	50	70
143 degrees	5 minutes	20	40	70
144 degrees	5 minutes	25	30	55
145 degrees	5 minutes	5	35	55
150 degrees	5 minutes	0	5	40

Summary.

1. The loss to Michigan this year in the oat crop alone, caused by smut, will be \$1,000,000, and this is a very low estimate. 2. The smut of oats and the stinking smut of wheat are parasitic plants. 3. The spores of these smuts attach themselves to the kernels of oats or wheat and are sown with them. 4. The spores germinate at about the same time the seed germinates, and, in some way, enter the young plant and live upon it until, finally, the head of the smut appears. 5. Both of these smuts can be entirely prevented at a slight expense by the Jensen or hot water treatment. 6. The water should be about 135° when the seed is put in and not allowed to fall below 130° . Remove the seed at the end of five minutes. 7. Professors Jensen, Swingle, Kellerman, Arthur, and others, have found that "this treatment not only removes the smut from the crop, but improves the growth and increases the yield." 8. The increased yield is sufficient to pay for the labor and trouble of treatment several times over. 9. Do not conclude that you have no smut because you do not see it. In the case of oats the smut is mostly blown off before harvest, and the smutted stalks, being shorter than the healthy ones, are not observed. 10. What the farmers of Michigan term "low smut" of wheat is a different species from the "high smut," but both are subject to the same treatment.

TABLE NO. 4—Oats.

NAME.	Date Sown.	Date Ripe.	Yield per Plat. lbs. oz.		Area in Acres.
White Dutch -----	4-9	7-29	15	9	1-80
Pringle's No. 6 -----	4-9	8-11	36	2	1-40
New Zealand -----	4-9	8-10	46	5	1-40
Chinese Hulless -----	4-8	8-4	252	9	1-4
S. C. Black -----	4-9	7-30	11	2	1-80
Silesian -----	4-9	7-29	8	11	1-160
Golden Giant -----	4-9	8-11	48	2	1-40
Highbred -----	3-30	7-29	272	6	1-4
Excelsior -----	3-30	8-9	351	9	1-4

Some figures on this crop are given in the foregoing table. The varieties named, with the exception of the Silesian, have been grown for two seasons. The Highbred and Excelsior have a good record in the past, and were raised one-fourth acre each to allow distribution to farmers as needed. In threshing the kernels of the Chinese Hulless came out perfectly clean, the same as wheat. In

visiting an oatmeal plant in Chicago the writer was told by the Superintendent that they used 8,000 bushels daily of the best ordinary oats to be obtained, largely for rolled oats. That for some reasons the Hulless would be better than the ordinary oats, but in growing the Hulless should be kept entirely separate from the ordinary kinds. To some parts of the mill the visitor is not shown.

Barley.

Notes on seven varieties of barley are given in Table No. 5. The Black and the Smooth Hulless gave a fair growth of straw, varying in length from 32 to 38 inches. The Guy Mayle, Purple, Winnipeg and Smooth Hulless are all hulless. The Trick's and Winnipeg are two rowed. The list has been grown for two years and appears quite well adapted to this climate. The Smooth Hulless is preferred in some portions of Nevada for horse feed.

TABLE No. 5.

NAME.	Date Sown.	Date Ripe.	Yield per Plat.		Area in Acres.
			lbs.	oz.	
Smooth Hulless-----	4-18	7-27	212	4	1-8
Winnipeg-----	4-18	7-26	148	6	5-48
Winter, six-rowed-----	4-9	8-3	30	9	1-40
Purple-----	4-9	7-27	35	14	1-40
Trick's-----	4-9	7-28	18	10	1-80
Guy Mayle-----	4-9	7-27	38	2	1-40
Black-----	4-9	7-26	16	6	1-80

Buckwheat.

One-twentieth of an acre of Japanese, drilled June 1st, made a fair growth, yielding in grain 33 pounds 2 ounces. An equal area, drilled June 10th, did not make as good a stand, yielding when threshed 17 pounds 10 ounces. Farmers can raise this without difficulty for home use, unless in sections where frosts are frequent.

Grain Without Irrigation.

For immediate returns, from the standpoint of the practical farmer, the results attained could not be called an unqualified success. Duplicate plats of two varieties of wheat and two of oats were used in this experiment. Portions of the plats failed to head. This, in connection with depredations by birds and squirrels, make definite returns impossible. Birds and squirrels have been a source of annoyance for two years. Fewer squirrels were noticed after putting out poisoned grain. The birds preferred to fly over grain

placed conveniently and make their own selections from standing grain. Shot is an effectual, although somewhat costly, means of clearing the field.

Notes more in detail will be given at a later date. The growth of the grain this season suggests the question, in times of necessity can a paying crop be grown with three well-timed irrigations? Some States use from one to three irrigations, the rainfall being from four to four and one-half inches for April and May, and the grain standing ten to fifteen inches high when the water is turned on the first time. Each irrigation costs the farmer cash, not only for water, but for labor to apply it.

Corn.

For field varieties a trial was made of the Pride of the North, Leaming and Chester County Mammoth Dent. The first named is a medium sized yellow dent, but of sufficiently rapid growth to ripen at this altitude or even four hundred higher. One-sixteenth of an acre of this variety was grown, yielding 205 pounds. This was planted May 24th and ripened September 17th. The height of the best stalks was eight feet one inch.

The Leaming is a fair sized field variety (seed from Cox, San Francisco), which grew to a height of nine feet one inch, with ears ready for table use September 2d. The planting was done June 3d, but it did not fully ripen. Chester County Mammoth Dent is rank in growth, the stalks growing to a height of ten feet and twelve feet in some localities in the East. This was planted May 31st and ripened one ear. It seems rather large for this section, but it may be possible to so manage the culture as to secure a medium crop. Table No. 6 gives the name, edible maturity and height of the stalks of several varieties grown for table use. From one season's trial we favor Early Mammoth Sugar, Stowell's Evergreen and Marblehead Early Sweet. Golden Tom Thumb popcorn planted June 3d ripened August 23d.

Notes have been taken on planting Pride of the North at different dates. The plan was to plant fifty hills April 20th, and follow this with a planting once in ten days till the sixth was finished. Owing to an oversight the planting due April 30th was omitted, thus making a break in the original programme, but we planted on the following dates: April 20th, May 10th, 20th and 30th, June 10th and 20th. The planting of June 10th and 20th made rather a slender growth of stalks.

The planting of April 20th ripened August 25th and maintained a growth in advance of other plantings, although repeatedly cut back by frost. In all probability Nevada is not the equal as a corn growing center of Illinois and some other States. It is doubtless true that corn and hogs, with some help from alfalfa or clover pasture and skim milk, can be made sources of profit in the farming

of this State. The mixed farming permits crop rotation, a prominent factor in maintaining the soil's fertility, and also divides the farm work and the revenue as well over the year. Work and cash coming in are not thrown into a few weeks, as is the case where the one or two crop system prevails.

TABLE No. 6—Corn.

NAME.	Edible Maturity.	Height of Stalks.	
		ft.	in.
Mammoth Early Sweet-----	8-15	6	11
Adam's Extra Early -----	8-26	7	2
First of All-----	8-15	5	6
Stowell's Evergreen-----	8-26	7	8
Early Mammoth Sugar-----	9-10	8	9
Greenhalgh's -----	8-18	-----	-----

Corn Drilled.

Sweet corn and Pride of the North, one-twentieth of an acre each were drilled May 31, in rows three feet apart, using seed at the rate of 56 pounds per acre. The cultivation and irrigation were the same as that of the corn planted in hills. Each grew 6 feet 2 inches in height. When well dried the stalks were weighed, the Sweet Corn yielding 618 pounds, or at the rate of 6 tons and 360 pounds per acre. Pride of the North 538 pounds, or at the rate of 5 tons 760 pounds per acre. Corn can be drilled for feed or it can be sown broadcast, using 1.5 to 2 bushels of seed per acre.

Sorghum.

The seed of 9 varieties was forwarded by the United States Department of Agriculture. This was drilled May 24, in rows 3 feet apart, 132 feet long. There were 2 rows of each variety. The growth for the season was quite good, although the Spring was so cool that even the persistent alfalfa was backward. The rows were thinned June 22, when 3 to 4 inches high, to 1 plant in a place and 6 to 8 inches apart. The cultivation with hoe and horse was such as to keep the ground mellow and entirely free from weeds. The irrigations were June 25, July 3, 11, 26.; August 3, 10, 19, 27 and Sept. 9.

The analysis by Prof. Wilson is given in Table No. 7. Folger's Early began heading Aug. 18 and lead in maturing seed, which was largely ripe on Sept. 7. McLean's began heading on August 23, although later in heading and ripening a much smaller number of heads, it gave a much higher sugar content than Folger's. The lat-

ter on September 17 measured in height 8 feet 6 inches; McLean's 9 feet 6 inches. Variety 91—About one-fourth produced heads, measured 8 feet. The three varieties named were the only ones heading. The Black African grows a thick heavy stalk.

TABLE NO. 7.—Sorghum. Sown May 24.

NAME.	Harvested	Sugar, Cent.	Solids, Per Cent.	Purity, Per Cent.	Weight of Cane, lbs. ozs.	Height, ft. in.
Folger's Early-----	9-16 10-10 10-12 10-12	8.90 11.10 10.00 10.00	16.20 21.60 18.00 18.20	54.94 51.38 55.55 54.94	333 9	8 6
McLean's-----	9-16 10-10 10-12	8.00 9.00 12.80	15.20 16.20 19.20	52.64 55.55 66.66		
Variety 91-----	10-10 10-12	8.10 8.50	19.40 17.00	41.75 50.00		
Link's Hybrid Variety-----	10-10	4.30	14.80	29.06	233 10	4 7
Colman's Cane-----	10-10	12.00	33.40	51.30	301 14	6 8
Collier's-----					260 9	7 7
Planter's Friend-----	10-10	4.50	14.00	32.05	222 4	4 0
Colman's Red-----	10-10	9.50	13.20	71.96	341 14	4 7
Black African-----	10	2.00	14.60	13.70	293 8	4 4

Cabbage.

Nine varieties were grown, the names being given in table 8.

In a trial of early and late planting, plants set in open ground June 15 and July 5 and 11, yielded by weight about one-fourth to one-half as much as those, same variety, set May 18. The growth of all varieties was checked to some extent by insects, although liberal use was made of a tobacco decoction and soap suds.

With us, this season, the tendency with the Winnigstadt has been to produce a solid head at almost any age. It is very firm even when half grown. This characteristic is shared about equally by the Mammoth Red Rock, Deephead, Stone Mason, Large Drum-head and Mammoth Marblehead. Lee's Wonderful and Lee's Excelsior were first in maturing, having a few heads in condition for market July 25th. The improved Flat Dutch was ready August 20th and the Deephead August 21st.

TABLE NO. 8.—Cabbage.

Fifty of each variety planted May 18th.

NAMES.	Number Forming Heads.	Large Heads.		Medium Heads.	
		Measure. Inches.	Weight. lbs. oz.	Measure. Inches.	Weight. lbs. oz.
Mammoth Red Rock--	26	5 x4.5	1 10	5.5x3.5	1 5
Deephed -----	46	8.5x4.5	4 9	7.5x4.5	4 3.5
Stone Mason-----	43	8.2x4.5	4 5.5	7.2x4.5	3 13
Large Drumhead-----	43	6 x6	2 15	6 x4.5	2 10
Improved Flat Dutch--	42	8 x3.25	4 15	7 x5	3 14
Mammoth Marblehead	46	9 x6	6 4	8 x5	5 3
Winnigstadt-----	50	7.5x6.5	5 4	7 x7	4 12
Lee's Excelsior-----	36	9.5x6.5	4 0	9 x5.5	3 3.5
Lee's Wonderful -----	41	6.5x6.5	3 9.5	9 x6	3 2

Tomatoes.

For a trial of varieties the list given in Table No. 9 was grown. Those numbers from 1 to 9 were taken from the hot bed and planted in the open ground from May 27th to 31st. The spring was cool and it seemed of doubtful advantage to put them out earlier. The order of naming in the table is according to yield with numbers from 1 to 9. The others were necessarily planted late, and for this reason not compared in yield with those of May 27th.

The tree tomato is the largest in growth of vine and fruit. The latter is somewhat irregular in outline and quite large. Some samples weighed nearly one pound. The first to ripen were Trophy and Livingston's Perfection, on August 21st. The other varieties were several days later, the Brandywine September 24th, and Dwarf Champion Peach. The seed was obtained from Mr. Ross Lewers, of Franktown. It resembles a medium sized peach. All who have given it a trial speak well of its quality. Its convenient size for household purposes has been especially recommended. Dwarf Champion with some is a favorite and ranks first in quality. The fruit is symmetrical, nearly round, and it keeps fresh a number of weeks. The plants present quite a contrast to all others and are short and compact. The fruit is in close clusters, and the foliage dark green, quite thick and corrugated. Some preliminary notes have been taken on the lasting qualities of the different varieties. The Yellow Plum seemed to possess this quality in a greater degree than any other grown this season. Placed in an open dish in the seed building, although shrinking, it was quite in good condition after eight weeks.

TABLE No. 9—Tomatoes.

NAME.	Large.		Medium.	
	Measure. Inches.	Weight. lbs. oz.	Measure. Inches.	Weight. lbs. oz.
Atlantic Prize -----	2.25x2	9	2.75x2.5	6.5
Livingston's Perfection	3.7x3	10.5		
Livingston's Favorite--	3.5x2	7	2.7x2.3	6.
Trophy -----	2.7x1.3	8	3x2	5.5
Mikado -----	4x2.25	10	3.5x2.25	9.5
Brandywine -----	3.5x2.5	8.5	3x2.5	8
Peach -----	1.7x1.7	2.5	2.7x1.5	2
Red Pear Shaped-----	1.2x1.6	1		
Dwarf Champion-----	2.7x2	5.5	3x2	5
Yellow Plum-----	1x1.6	1		
* Matchless -----				
Ignotum -----	4x2	10	3.5x2.5	8

* Did not ripen.

Lettuce.

Ferry's Prize head was the only variety grown. This proved to be desirable on account of its tender, crisp quality, and also remaining for a number of weeks in condition for the table.

Cucumbers.

The crop as a whole was good; some varieties excelling in quantity, while others were more satisfactory for quality. The White Spine did best in yield, uniformity of size and good keeping qualities. Weight of one, 1 pound 13 ounces; measure, $8\frac{1}{4}$ by $3\frac{1}{4}$ inches; weight of one, 1 pound 7 ounces; measure, $8\frac{1}{2}$ by 3 inches; weight of one, 2 pounds; measure, $7\frac{1}{2}$ by $2\frac{1}{2}$ inches.

BOSTON PICKLING—Placed first for pickles; yield next to White Spine. Weight of one, 11 ounces; measure, 6 by $2\frac{1}{2}$ inches; weight of one, 13 ounces; measure, 5 by 3 inches; weight of one, 12.5 ounces; measure, $6\frac{1}{4}$ by $2\frac{3}{4}$ inches; weight of one, 1 pound $1\frac{1}{2}$ ounces; measure, $6\frac{3}{4}$ by $2\frac{3}{4}$ inches.

SNAKE—Seed was evidently mixed; producing cucumbers from yellow in color, resembling a muskmelon in color and taste, to gray; rather coarse in texture. Weight of seven, 25 pounds 8 ounces; length of one, 3 feet $2\frac{1}{2}$ inches; length of one, 4 feet 4 inches.

WAR CLUB—Third in yield for this season; does well for pickles if used when small. Weight of one, 1 pound $10\frac{1}{2}$ ounces; measure,

12 by 3 inches; weight of one, 14 ounces; measure, 10 by $2\frac{1}{4}$ inches; weight of one, 2 pounds 7 ounces; measure, 14 by 3 inches.

GIANT PERA—Fourth in yield; slightly coarse grained; does not keep as well as some other varieties named. Weight of one, 1 pound 7 ounces; measure, 9 by 3 inches; weight of one, 1 pound 3 ounces; measure, 10 by 2.5 inches; weight of one, 2 pounds 3.5 ounces; measure, 11.25 by 3.25 inches; weight of one, 4 pounds 10.5 ounces; measure, 15.5 by 4.75 inches.

Carrots.

Of this kind of stock feed we grew Ox Heart, Long Orange, Danver's White Belgian and Improved Short White. Most of these are standard varieties that have been for years on the market. The Ox Heart admits of harvesting with less effort than the others, due to its quite short stocky make up. Long Orange, Danvers and White Belgian are desirable for yield.

Eclipse Beet, Early Turnip Beet, Early Purple Top Turnip, large White Norfolk, Skirving's Rutabaga, each grown in small quantity made a fair return. The above named vegetables can be raised by farmers in small quantity at moderate expense for the table, and as an occasional relish for a few head of horses. As a general rule the American farmer, at least for some years yet, will not raise root crops in large quantities for the reason that help for thinning is costly, and cheaper food can be raised in the shape of alfalfa, silage, clover or timothy.

Notes on pepper, peas, radish and kale are held for further trial and comparison.

Melons.

A creditable growth was made by several varieties of water melons. Full and definite data with reference to melons is difficult to obtain on account of the prevalent idea among Americans that this product, whether raised by the United States or individuals, is common property. Weights and measures are to show the growth of the several varieties. Figures are given below indicating the size attained with us this season.

GEORGIA RATTLESNAKE—This we consider a good variety, productive and a good keeper; uniform in size; four weighed 76 pounds; one measured $18\frac{3}{4}$ inches long.

KENTUCKY WONDER—One of the early varieties; fair for yield; flavor good; considerable difference in size; two weighed 39 pounds; one weighed $20\frac{1}{2}$ pounds and measured in length 15 inches.

NETTED GEM (Musk.)—These melons are small; measure from 3 to 5 inches in diameter; flavor good; keep well; uniform in size; productive in numbers.

CUBAN QUEEN—Specimens are round in shape; not considered as good flavor as the Kentucky Wonder or Georgia Rattlesnake; very good keeper; weight of one, 19 pounds; length, 13 inches; weight of one, 13 pounds 8 ounces; measure, 9.5 by 9.5.

PRIDE OF GEORGIA—This is a fine looking melon in the field; color dark green, with a tinge of stripe that shows indistinctly; red core; flavor, one of the best; not as productive as some varieties; weight of four, 69 pounds; one weighed 18 pounds, and measured 10.5 by 10.5 inches.

DELAWARE—One of the late varieties; quite productive; color dark green, with stripes a shade lighter; good keeping qualities; weight of four, 85 pounds; weight of one, 25 pounds; length, 16.5 inches; weight of one, 12 pounds 14 ounces; measure, 7.5 by 13 inches.

IRONCLAD—A productive variety; resembles the Delaware; weight of one, 21.5 pounds; length, 17 inches; weight of one, 14.5 pounds; measure, 13 by 7.5 inches.

Squashes.

The standard variety, the Hubbard, did not do as well as usual. This was partly due to planting on a plat near the wall. The weight of three was taken, giving 8.25, 5 and 10 pounds.

Mammoth Chili—The seed was purchased from Cox and Burpee. Occasionally one is found that does well for the table. Frequently they are soft and watery when cooked. They are grown usually for stock. The largest weighed 35 pounds, seed from Cox. Largest, seed from Burpee, 29 pounds.

Summer Crookneck—Considered one of the best of the summer squashes. Of this variety a large one weighed 3 pounds 8 ounces, and measured 15 by 5 inches.

Boston Marrow—One of the best as a fall squash. Good for cooking and grows to a fair size. Some of the weights are as follows: 18 pounds 11 ounces, 13 pounds 15 ounces, 21 pounds and 22 pounds 8 ounces.

Perfect Gem Squash—This squash, although small, is one of the most satisfactory raised this season. Planted June 7, it was ready for use September 21. It is fine grained and cooks to good advantage. Six weighed 9 pounds 14 ounces.

Pumpkins.

Oblong—A small variety, light in color. By some considered excellent for pies. One of the largest weighed 10 pounds.

Japanese—Seed from Burpee. One grower recommends it for pies and custards. The seed cavity is small; in one end of the pumpkin, the remainder being solid meat. One weighed 13 pounds, another 9 pounds 8 ounces and measured 21 inches in length.

Potiron—This resembles the Chili Squash in outward appearance. Weight of one, 42 pounds, 17 inches in diameter. One, 33 pounds; one 66 pounds. Fair for cooking.

Egg Plant

Grew well during the season and produced fine looking, dark purple fruit. Fried and prepared in other ways, this fruit ranks among the first. So far as noticed, the plants grew without any check from insects. Some notes are given on the New York Purple:

Weight.	Measurement.
2 pounds 13 ounces -----	3.5 by 8 inches
2 pounds 3 ounces -----	5 by 7.5 inches
2 pounds -----	5.5 by 6.5 inches

Black Pekin.

1 pound 9 ounces -----	4.75 by 4.75
1 pound 6 ounces -----	4.75 by 4.5
1 pound 5 ounces -----	4.75 by 4

Flax.

One-twentieth of an acre was drilled, using seed at the rate of 90 pounds per acre. Adjoining this an equal area was drilled at the rate of 240 pounds per acre. Both were sown for fiber. The growth of straw was not equal to that of 1891. In the field there was little apparent difference between the two plats; the heavy seeding grew finer straw and seemed to carry less seed, although the scales showed. Seed—Light seeding, 34 pounds 7 ounces; heavy seeding, 35 pounds 10 ounces. Corresponding was done to get ramie plants, but without success. To Mr. William F. Leete, of Reno, I am indebted for samples of decortiated ramie, one sample being bleached.

Forage.

As a start in this line fifteen varieties of grasses and clovers were sown on the south half of Plat 9. Considering that they were sown without grain as a protection they made a fair growth for the first season.

Jerusalem Corn.

One twentieth of an acre of Jerusalem corn was planted June 2d, which yielded 298 pounds 12 ounces, or 5,975 pounds per acre.



TOBACCO FIELD, STATION FARM, SEASON 1892.

This corn belongs to the nonsacharine sorghums. At Garden City, Kansas, where it has been tried without irrigation, by Superintendent Brooks, it is well recommended for homing or stock feed. Milo Maize, planted July 3d, produced 783.5 pounds, or at the rate of 7,184 pounds per acre. The forage question is one that will receive constant attention, not only at the Station grounds, but through correspondence and noting of comments from the best journals. This is justly due the stock interests of the State, and especially would any one confer a favor who will send in grass seed, even in small quantity, of some variety that gives promise of doing well with the minimum amount of moisture. For a fairly balanced ration, an all-around feed for the arid region, it is doubtful if we can find anything to excel, or even equal alfalfa.

Potatoes, Tobacco and Peanuts.

Notes on sixty-seven varieties of potatoes, on tobacco, and on peanuts will be given at a latter date. Some of the best of our potatoes were those planted in December.

Vetch.

Of this forage plant, which is fed to horses in some parts of Europe, and to cattle with some care after the pods have formed, one-fortieth of an acre was grown. The cutting was not done until late. Repeated and sharp frosts made very little change in its appearance; the growth was quite strong. One hundred and twenty-nine pounds 8 ounces were harvested, or at the rate of 5,180 pounds per acre.

Sugar Beets.

The details of the work with sugar beets are given in Bulletin No. 19. One shipment was made to Dr. Wiley, Chief Chemist of the Department of Agriculture, who says in a letter: "In response to your communication bearing date of November 11, I take pleasure in saying that your beets are excellent in shape, although somewhat small, and are extremely good as far as sugar contents go, as you may see from the report sent under separate cover."

In regard to size, the largest beets were avoided in making up the shipment for Dr. Wiley. As a general rule with well bred seed on good land, the size of sugar beets will be practically regulated by the distance between the rows, and especially the distance between plants in the row.

Exhibit.

An exhibit of grain, threshed and mounted, showing field growth and other farm and garden products was made at the State Fair and also at the District Fair held in Carson.

August 15th Mr. R. A. Lounsbury began work as farm Foreman. His previous experience with student labor, irrigation, stock and the exacting details of experimental farm work as conducted in one of the best agricultural colleges in this country, enabled him to take hold at once in such a manner as to make his assistance of special value. He appreciates the fact that in executing plans for farm and garden experiments constant vigilance is necessary.

Respectfully submitted,

R. H. McDOWELL.

DEPARTMENT OF CHEMISTRY.

To the Director of the Nevada Agricultural Experiment Station :

SIR: It is my pleasure to submit herewith the report of the Department of Chemistry for the year ending December 31, 1892.

The work of this department the past year has been of a quite general nature. The various lines which have received attention are: The analyses of forage crops, analyses of home raised tobacco, dairy products, fertilizers and fertilizing material, drinking waters, sorghum, sugar beets and soils. Special attention has been given to dairy work, and the necessity and importance of milk testing has been repeatedly brought to the attention of the farmers of the State, and very encouraging results have been attained.

In April, Bulletin No. 16, "Creamery Industry," was issued, treating in full the subject of butter making. The demand for similar information concerning cheese manufacture seemed to warrant the publication of a separate bulletin on that subject, and during December Bulletin No. 18, "Cheese and Its Manufacture," appeared.

At the Nevada State Fair held at Reno, September 19 to 24, inclusive, we exhibited a working laboratory fitted complete for testing dairy products and sugar beets. I was greatly aided in this work by Mr. Frederick Stadtmuller, Assistant in Chemistry in the University, who kindly offered his services.

This exhibit attracted a great deal of attention, and the explanation of the different processes was listened to with interest. The exhibit was afterwards taken to Carson City and shown at the District Fair, where it also excited a great deal of interest. By request of the Directors of the Eleventh District, California Fair, we exhibited also at Sierraville, October 3d to 6th inclusive, where the milk testing apparatus was highly appreciated, the farmers bringing twenty-five samples to be tested on one occasion. As the dairy interests of the State are advancing rapidly, and recognizing the great benefits to be derived by the farmer from carefully testing his herd, and by the creamery man in paying for his raw material and controlling his losses in separator and churn, by the use of the tester, I would recommend that steps be taken to visit as many of the District Fairs of this State another fall as possible, in order to exhibit and explain the process of milk testing and its importance from a commercial standpoint.

The sugar beet experiments of last year have been continued and the result of the analysis of samples from the Station farm, and from the State at large, are now under way. Results thus far obtained are very encouraging and support those of last season. A report of this work will be embodied in a bulletin shortly to be issued by this and the Agricultural Department jointly.

Several samples of sorghum grown on the Station farm were analyzed, but show unsatisfactory sucrose (sugar) development, the lowest percentage being 2.00 and the highest 12.80.

The analysis of drinking waters have received considerable attention. This is a matter of serious sanitary importance in many localities. Several samples of adulterated foodstuffs have been brought to the laboratory, and while they have in all cases been analyzed, no public report has been made, as there is no law regulating the sale of such goods in this State. Special attention is now being given to the analysis of soils taken from the best agricultural sections of the State for exhibition at the World's Columbian Exposition.

Several newspaper bulletins have been issued during the year, and will be continued from time to time in the future.

A summary of the laboratory work of the last year, complete, is as follows:

Laboratory Work.

Sugar beets -----	250 samples
Sorghum -----	16 samples
Milk and butter -----	165 samples
Water (sanitary analysis) -----	98 samples
Fertilizers and fertilizing material -----	10 samples
Insecticides -----	2 samples
Miscellaneous -----	6 samples
Total -----	458 samples

The proposed work for the coming year is along the same general lines, bringing every effort to bear upon the development of those lines, most important to the present needs of the farmer. During the past year considerable has been done in the way of additional equipment. Among other things a large hydrogen generator and apparatus for drying in a current of hydrogen have been added; also a very fine mill for grinding fodders, etc., for analysis. New water ovens and a large immersion bath have been purchased. These articles, with the apparatus we have on hand, fit the laboratory very completely for the Station work. The one great need of

the department is more laboratory room, and we trust steps may be taken to make this available.

I desire to extend to you, and through you, to the Board of Control my appreciation of favors received and the support given to this department.

Respectfully submitted,

NATHANIEL E. WILSON,

Station Chemist.

DEPARTMENT OF ENTOMOLOGY AND BOTANY.

S. A. Jones, Director Agricultural Experiment Station:

SIR: I herewith present the following report of the Department of Entomology and Botany for the year 1892.

During the year the Department's efficiency has been, I believe, materially increased. This has been brought about by an increase in equipment, and by the acquisition of a better knowledge of conditions and demands in matters peculiar to this Department. A marked increase in the interest of the people of the State in Entomology and Botany has been manifested during the year.

Bulletin No. 17 of the Station series was issued by the department in July. This relates to the woolly aphid of the apple, a matter which at that time was creating much general interest. The publication of this bulletin was preceded by a newspaper bulletin in relation to the same subject, and which was sent to each of the papers of the State for publication.

Regarding the insects observed during the year that are more particularly injurious, are the following:

The codling moth, *Carpocapsa pomonella*, seems to be increasing, judging from the difficulty in obtaining sound apples in the market. Those orchards most isolated, and where protective measures, consisting usually of banding the trunks of the trees, have been taken, have yielded a comparatively high percentage of sound fruit. The use of Paris green and London purple as a preventative of damage by this insect has not as yet received general attention in this State.

The "Corn Worm," *Heliothis amigera*, known in the South as the "Boll Worm," a name received from its habit of boring into the cotton bolls, and common in various parts of the country as an enemy of green corn, is becoming very common in the vicinity of the Experiment Station. Both field and table corn seem to suffer alike. The eggs of this insect are usually deposited in the tip of the ear. The young larva works its way into the kernels, usually destroying the silk in the process. The larva continues its destruction of the kernels till it attains maturity, when it bores through the husk and descends to the ground. Here it completes its transformations and emerges in the form of a moth. Specimens reared in the laboratory demonstrate that there are two broods of this insect each year.

Cabbages in the vicinity of Reno have suffered materially during the year from a light green worm, an inch or more in length, which eats large irregular holes in the leaves. The parent of this insect is a small moth, *Plusia trassicae*. Great numbers of these larvæ were found in some gardens, while in others they seemed less plentiful. A large proportion of the larvæ of this species, brought to the laboratory to complete their transformations, produced a parasite from the chrysalis, showing that a natural enemy destroys many of these insects.

The cabbage lice were very plentiful. These may be expected each year, and must receive considerable attention if they are to be controlled. The tomato has here at least two insects that are of importance. The large green worm, *Mecrosila 5-maculata*, which destroys the leaves, has been found in considerable numbers at both Reno and Carson. Green tomatoes bored into by the larva of the moth, *Lithophane antennata*, have been received at the Station. This larvæ, which was so destructive to rosebuds in 1890, has not been reported as injurious in this respect this year.

The Carpet Beetle, *Anthrenus scrophulariae*, is very abundant. Not only is it found in dwellings, but it is also one of the commonest of beetles found on flowers in the spring.

The dark colored, yellow spotted spinous larvæ of *Pyrameis cardui* are found in considerable numbers on the leaves of the hollyhock. The black, white and pink butterflies produced by these larvæ are among the commonest butterflies we have. The food supply of this insect fortunately is not confined to the hollyhock, but includes also our common wild sunflower, *Helianthus annuus*, and other plants of economic importance.

The larvæ of another butterfly, *Grapta satyrus*, which is closely related to the last named insect and which somewhat resembles the larva of the latter, has been found this year feeding upon the leaves of the hop. A number of crysalids of this species taken for study produced a great number of parasites, which indicate that the insect probably never will become particularly injurious.

The pear and cherry slug, *Selandria cerasi*, has, as usual, been very abundant.

The work in botany has included a continued study of the local flora, making contributions to the herbarium of local plants, the identification of specimens sent to the Station for determination, and considerable attention has been given to the weeds of this portion of the State, preparatory to issuing a series of bulletins which shall treat of these weeds in such a manner that the latter may be identified when found intermixed with the seed of grasses and clovers.

The department is indebted to a number of individuals who have kindly contributed interesting specimens to the collection of plants and insects. Very respectfully submitted,

F. H. HILLMAN,
Entomologist and Botanist.

ERRATA.

Page 9, 21st line from top—read 2 instead of “4.”

Page 11, 21st line from bottom—read different instead of “differet;” and 10th line from bottom—read a land instead of “the land.”

Page 12, 6th line from top—read in instead of “on;” and 15th line from bottom—insert the word these before “spores.”

Page 15, 3d line from top—read exceed instead of “be.”

Page 20, 14th line from bottom—read Dwarf Champion, Oct. 10. Peach—instead of “Dwarf Champion Peach.”

Page 21, in Table 9, the names of varieties should be numbered consecutively from 1 to 12.

Page 22, 19th line from bottom—read peppers instead of “pepper.”

Page 24, 10th line from bottom—read decorticated instead of “decor-tiated.”

Page 25, 3d line from top—read hominy instead of “homing.”

Page 28, table of Laboratory Work—read Water (sanitary analysis) 8 samples, instead of “98 samples;” and total, 457 samples instead of “458.”

Page 30, 15th line from bottom—read preventive instead of “preventative.”

